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URBANIZATION AND REHABILITATION

OF

PITS AND QUARRIES

By

D. F. Hewitt and M. A. Vos

A paper presented at the 72nd Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Toronto, April 20, 1970

INDUSTRIAL MINERAL REPORT 34

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CONTENTS

Page

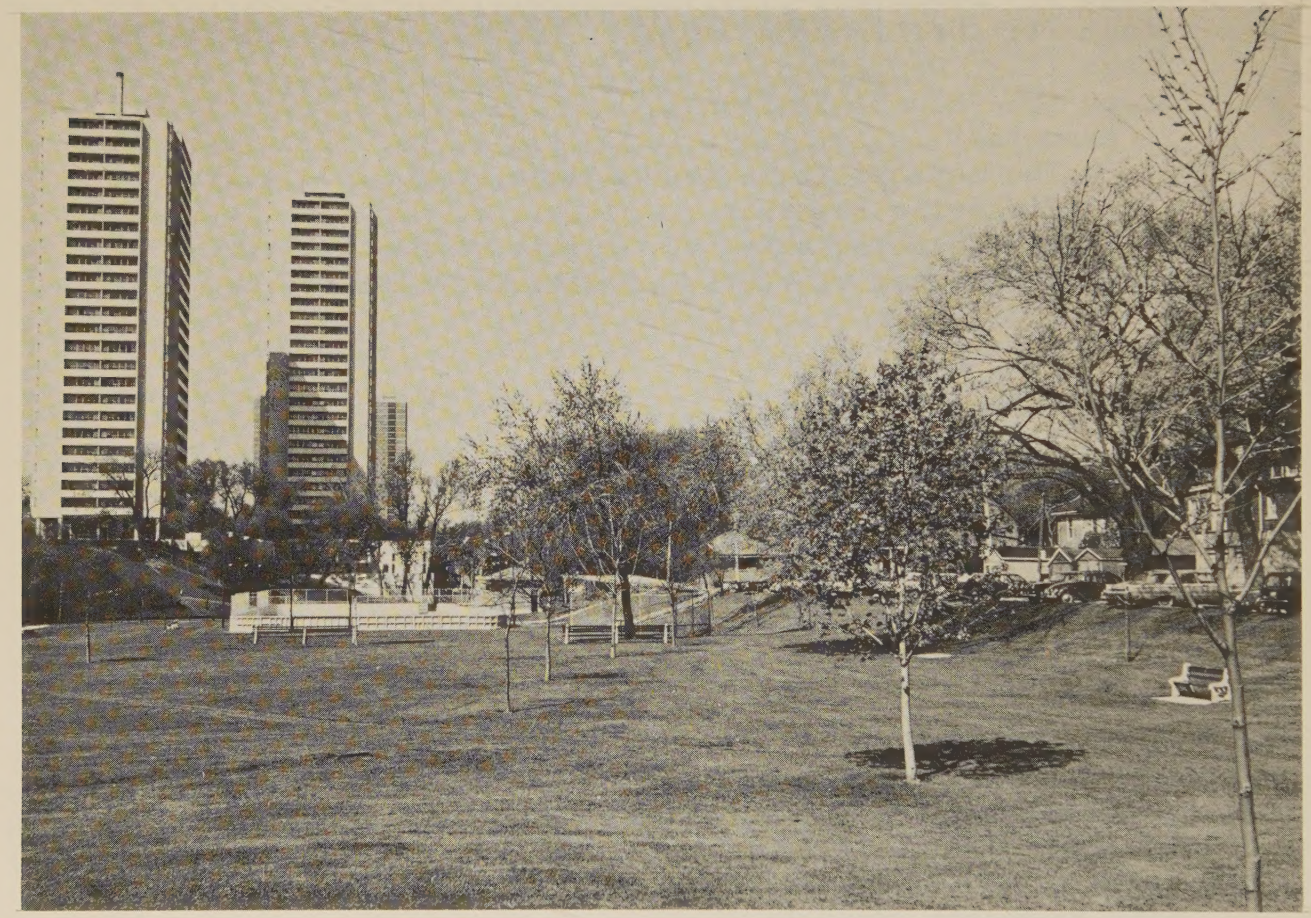
Introduction 1
Transportation 5
Maintaining Environmental Quality 9
Life Cycle of the Aggregate Industry in a Municipality.. 10
Stage I: Discovery 10
Stage II: Utilization 11
Stage III: Depletion 11
Stage IV: Rehabilitation 13
Examples 14
The Metropolitan Toronto Area 14
Pickering Township 16
Uxbridge Township 17
Selected References 21

TABLE

1. Aggregate Production - Ontario 1967 3

PHOTOGRAPHS

Ramsden Park on Yonge Street, Toronto iv
Tree screening at Nelson Crushed Stone, Burlington Ontario 8
Homes on a lake shore where once there was a quarry, near Ridgeway, Ontario 12
Looking north on Jane Street, an area in which residences and high rise apartments occupy the site of a former gravel bar east of Scarlett Road, Toronto 15
Waterford Ponds, Big Creek Region Conservation Authority. Gravel operations in progress in background 19
The swimming pool at St. Mary's, Ontario, has been developed on the site of a former quarry 20



Ramsden Park on Yonge Street, Toronto, was the former site of a brick yard and clay pit now rehabilitated for parkland. Photo by D.F. Hewitt.

URBANIZATION AND REHABILITATION OF PITS AND QUARRIES

By

D.F. Hewitt[1] and M.A. Vos[2]

INTRODUCTION

The relentless urbanization of southern Ontario has led to a great expansion of the production of essential mineral raw materials for construction, such as sand, gravel, crushed stone, clay, shale, gypsum and stone for portland cement and lime. In 1950 the Toronto-Hamilton-Niagara area had a population of 2,000,000 and used 7,082,788 tons of aggregate, or approximately 3.5 tons of aggregate per capita. In 1968 the Toronto-Hamilton-Niagara area had a population of about 3,744,000 and used about 49,000,000 tons of aggregate, or approximately 13.5 tons of aggregate per capita. It is expected that by 1980 the per capita consumption of aggregate may reach 18 tons and the tonnage required will approach 90,000,000 tons. A similar expansion of the use of construction aggregates is expected for other areas of Ontario.

As urbanization proceeds, more roads, sidewalks, bridges, sewers and buildings are required and an increasing tonnage

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of aggregates is consumed. However the increasing consumption of aggregates has been outpacing the population increase, as the per capita figures indicate. This is in part explained by a change in the pattern of urban living: twelve lane expressways replace two lane roads; there is an increase in high rise apartments and office buildings using reinforced concrete; more buildings are faced with precast concrete panels; there is a development of shopping malls and parking lots with many acres of asphalt pavement.

Table 1 gives figures on aggregate production in Ontario, and various areas of Ontario in 1967. The average production and consumption of aggregates for the province are approximately equal as there are imports into the Windsor area from Michigan and Ohio, which are pretty well balanced by exports from the Port Colborne area. The average production and consumption of aggregates in Ontario as a whole in 1967 amounted to 17.8 tons per capita.

In northern Ontario the aggregate production and consumption per capita was 23.4 tons in 1967. This higher rate than the average for Ontario is due to the small population in a large area, and the large tonnage of aggregates needed for roads. In 1967 the consumption of aggregates in northern Ontario by the Ontario Department of Highways alone amounted to 9,724,993 tons or 15.4 tons per capita. The production and consumption of aggregates from private pit operators in northern Ontario

in 1967 was 8.0 tons per capita, for a total of 23.4 tons per capita.

In southern Ontario the per capita production and consumption of aggregates in 1967 amounted to 17.2 tons.

Table 1. Aggregate Production - Ontario 1967

Area	Tonnage	Population	Tons per capita
Ontario	120,496,229	6,765,000	17.8
Northern Ontario	14,809,628	632,431	23.4
Southern Ontario	105,686,601	6,132,569	17.2
Windsor-Essex	2,019,107	279,212	7.2
Ottawa-Carleton	4,867,303	410,810	11.9
Kitchener-Waterloo	2,740,285	219,273	12.5
Wentworth-Halton-Peel-York-Ontario Cos.	39,352,749	2,888,100	13.6
Woodstock-Oxford	1,059,447	75,417	14.0
London-Middlesex	3,539,988	249,464	14.2
Lincoln-Welland	5,763,516	324,842	17.7
Simcoe County	3,113,560	137,886	22.6
Haldimand-Norfolk	2,189,959	80,242	27.2
Brantford-Brant	3,309,504	86,528	38.2
Parts of			
District of Cochrane	963,215	38,312	25.2
District of Thunder Bay	3,365,436	130,383	25.8
District of Kenora	1,640,814	43,046	38.0

Table 1 indicates that aggregate production ranged from 7.2 tons per capita in the Windsor-Essex County area, which is deficient in aggregates and must bring aggregates in, to 38.2 tons per capita for the Brantford-Brant County area which is a large shipper of aggregates to the Toronto area. It should be emphasized that the figures in Table 1 are based on company

returns to the government, and represent a minimum figure as probably only about 70 percent of the producers are reporting.

TRANSPORTATION

It is essential that the urban area have an adequate resource base of construction aggregates to maintain a healthy and economical construction industry. The sources of construction aggregates are being threatened by three factors:

(1) Depletion: sources of construction aggregates are depleting, non-renewable assets and deposits close to urban areas are being worked out. This is particularly true of the Metropolitan Toronto area where over 60 pits were formerly worked and are now depleted or built over.

(2) Restrictive Zoning Regulations: under Section 30 of the Planning Act of Ontario, municipalities are empowered to prohibit the operation of pits and quarries in their area of jurisdiction. This has resulted in a large number of rural municipalities adjacent to urban areas bringing in by-laws to prohibit the operation of pits and quarries in their areas. There are many examples of this in the Toronto-Hamilton area, where a large supply of construction aggregates is essential to the growth of the urban areas. The concept of conservation and utilization of mineral resources within a municipality for the common good is not now widely held. A policy of mineral resource zoning in municipalities is desirable, and some progressive municipalities have developed such a policy.

(3) Urban Sprawl: as urbanization spreads, many deposits of construction aggregates are built over and effectively removed from consideration as future reserves. This has happened repeatedly in the Toronto-Hamilton area.

As sources of aggregate are wiped out by the action of these three factors, it is necessary for the urban areas to bring in aggregates from more distant sources. Aggregates are a large tonnage, low-cost commodity and transportation costs are high. At the present time in Toronto, it is estimated that the cost of aggregates on the job site is comprised of 40% for the aggregates and 60% for transportation. Most of the transportation is done by truck haulage at a cost of 3½ to 5 cents per ton mile. The matter of transportation costs is discussed by Hewitt (1968, p.10-11). The current costs of moving aggregate in the Toronto-Hamilton-Niagara area is estimated to exceed $50,000,000 annually.

In 1968 rail haulage to the Toronto market amounted to 2.5 million tons of aggregate or about 5% of the total. The remainder moved by truck. Aggregates are shipped by rail to Toronto from as far west as Paris, as far north as Orillia, and as far east as Brighton. Freight rates range from 99¢ to $1.47 per ton depending on the size of shipment and the number of consignees. In addition there are charges for special services, weighing, sorting of cars, etc.

In 1969 there were about 25 rail receiving points in the Toronto area. Only six of these are stone depots capable of receiving a full train of 50 cars. Where aggregates are transported to Toronto by rail, there is the cost of rail haulage, plus the cost of handling at the stone depot, plus the cost of distribution to the market area by truck.

Tree screening at Nelson Crushed Stone, Burlington, Ontario. Photo courtesy of Nelson Crushed Stone, Division of King Paving and Materials Limited.

MAINTAINING ENVIRONMENTAL QUALITY

At the present time considerable emphasis is being placed on the importance of maintaining or improving the quality of our environment. As this general policy gains acceptance, it will be necessary for the aggregate industry to try to decrease the annoyance factors which often accompany the operations, such as noise, dust, blasting, and heavy traffic density. Recommendations have been made in Ontario for the stricter regulation of the siting, operation and rehabilitation of pits and quarries in the province. These recommendations include noise level regulations for the pit and quarry industry; establishment of tree screening, fencing, dust control, plant and pit setbacks, replacing of top soil and other measures which will improve the image of the industry with the public. An interesting conference on "Mining in an Urban Landscape" was held in 1968 at the University of Guelph under the auspices of the School of Landscape Architecture. The conference proceedings have been published and many points of view are given.

LIFE CYCLE OF THE AGGREGATE INDUSTRY IN A MUNICIPALITY

The life cycle of an aggregate deposit or of the aggregate industry in any particular municipality goes through four stages:

I. Discovery
II. Utilization
III. Depletion
IV. Rehabilitation

Stage I: Discovery

The rate of discovery of aggregate deposits in a municipality depends to a large extent on the type and morphology of the deposit. Eskers and beaches usually have strong morphological expression and are relatively easily discovered by examination of aerial photos or ground reconnaissance. Kames and meltwater channels are often somewhat less obvious. Buried kames are often difficult to locate. In a large area of kame moraine such as the Oak Ridges kame moraine, the location of individual gravel deposits in the kamey outwash may be difficult, and exploration requires use of the backhoe and auger drill. Geophysical methods have proven useful in some cases. Seismic and resistivity methods are the most popular. Some interest is shown in airborne geophysical methods of detecting sand and gravel deposits.

The rate of discovery also depends to a large extent on

the rate of exploration. In areas close to cities the rate of exploration is high.

Stage II: Utilization

The rate of production is dependent on the type of material in the deposit: the percentage, size and quality of the gravel, and the percentage, size and quality of the sand. It also depends to a large degree on the state of the construction industry in the area. The location of the deposit and availability of markets are prime considerations. Sometimes the best gravel and concrete sand will be mined from a deposit, and the less desirable sand fill material will remain largely undeveloped until market demands make exploitation economic. For this reason it is not always easy to predict the length of the period of utilization of a deposit even though the reserves are known. Some deposits are worked on a demand basis and are only active intermittently. Frequently planners in the municipality wish to know how long a property can be expected to exist in a particular location. The factors mentioned above make exact predictions of the life of a deposit difficult.

Stage III: Depletion

When the reserves of the deposit are exhausted, the property reaches the stage of depletion. Sometimes tonnages

Homes on a lake shore where once there was a quarry, near Ridgeway, Ontario. Photo courtesy of the Ontario Mining Association.

of materials remain in the pit which are not saleable. There has been a tendency for some operators to hold the pit in a stage of near depletion for some time without rehabilitation of the site. This practice is responsible for many eyesores on the landscape and it is hoped that new requirements will be forthcoming for progressive and final rehabilitation of pits and quarries which will remedy this condition.

The unsightliness of holes in the ground left by pit and quarry operations has been the cause of much concern in municipalities. With the present emphasis on control of environmental quality, rehabilitation becomes of paramount importance if the aggregate operation is to be accepted in the community.

Stave IV: Rehabilitation

It has been suggested that pit and quarry operators be required to file a site plan, which, among other things, would outline a program for the progressive and ultimate rehabilitation of the pit or quarry property. The economic incentive to rehabilitate a property has depended to a large extent on land values in the area and the pressures of urbanization. Rehabilitation has been most rapid and complete in areas like Metropolitan Toronto where land values are high. Until now, the profit motive has been the paramount factor in rehabilitation. To some extent rehabilitation of land not in

immediate demand will depend on the tax assessment of worked-out land by the municipality. In some cases in the past it has proven advantageous for a company to leave the property in a depleted state. With stricter control of rehabilitation by means of a performance deposit by the operating company, the problem of rehabilitation of worked-out properties will be alleviated.

EXAMPLES

Photographs of some of the rehabilitated pit and quarry sites in southern Ontario are given in A.M. Bauer's recent publication, "A Guide to Site Development and Rehabilitation of Pits and Quarries".

The Metropolitan Toronto Area

The Metropolitan Toronto area is an example of a municipality in the Rehabilitation Stage with regard to pits and quarries. Over 60 clay pits and gravel pits have been operated in Metropolitan Toronto. These are all rehabilitated and the deposits are depleted or built over.

Professor A.P. Coleman's map 41g of the Toronto area (Coleman 1932), published by the Ontario Department of Mines in 1933 shows the location of two extensive gravel bars along

Looking north on Jane Street, an area in which residences and high rise apartments occupy the site of a former gravel bar east of Scarlett Road, Toronto. Photo by D.F. Hewitt.

the old Lake Iroquois shoreline in Metropolitan Toronto.

One gravel bar, about 3/8 of a mile wide, extends eastward from Scarlett Road just north of St. Clair Avenue, to the intersection of St. Clair and Keele Streets, a distance of some two miles. Several photographs of rehabilitated pits in this area are illustrated. Housing developments, industry and parks are the principal uses now developed on the depleted sites.

The second gravel bar, about ½ a mile wide, extends from the Toronto East General Hospital on Coxwell Avenue, eastward, crossing the Danforth just east of Woodbine Avenue, and extending eastward past Birchmount Avenue, a distance of over three miles.

These two gravel bars supplied a great deal of the aggregate necessary for the growth of Toronto. They are now depleted or built-over and rehabilitation of the pit areas is complete.

Several rehabilitated clay pits in the Toronto area are pictured in Bauer's report (Bauer 1970).

Pickering Township

With the depletion of sources of aggregate in the Metropolitan Toronto area, the industry began to reach out into adjacent neighbouring townships. One of the first areas

to be developed was the ancient Lake Iroquois beach in Scarborough and Pickering Townships. The location of the beach in Pickering Township is well-known, and the deposits are mainly discovered and utilized. The township is now reaching the stage of depletion for many of the deposits, but extensive rehabilitation has not yet begun. A program of sanitary land fill of gravel pits in Pickering Township has been contemplated by Metropolitan Toronto and Pickering Township.

Uxbridge Township

Much of Uxbridge Township is occupied by the gravel-rich Oak Ridges kame moraine (Hewitt 1969). At the present time this township is in the stages of discovery and utilization. New deposits remain to be discovered, and production from present pits is substantial. Ontario Department of Mines Map 2124 (Hewitt 1969) indicates 48 gravel pits in the township at the time the survey was made. Some of these pits are no longer worked. In 1968 the sand and gravel production from Uxbridge Township amounted to approximately 3,800,000 tons.

As the sand and gravel production from Uxbridge Township has increased, and as the area has become more urbanized, the increase in annoyance factors of the extraction industry, such as noise, dust and heavy truck traffic has caused

considerable concern to the residents of the township. The township is a classic example of what happens when the peak of an uncontrolled utilization cycle is reached. What James R. Dunn (1970, p.3) refers to as the "Irritated Neighbour Syndrome" also reaches a peak.

There is a basic conflict between the need for an adequate supply of essential construction aggregates, and the desires of many residents of the community that no extractive industry be established. The most moderate and equitable solution of the problem would seem to be stricter control of the siting, operation and rehabilitation of pit and quarry sites, and a fostering of the growing desire among the aggretate producers to improve their public image.

It must be borne in mind by planners that the aggregate deposits are depleting assets; the industry in any one area is cyclic, passing from discovery to rehabilitation in perhaps 10 to 30 years; conditions can be ameliorated during the peak of the cycle by wise controls; planned progressive and ultimate rehabilitation will result in maintaining or enhancing the quality of the environment.

Waterford Ponds, Big Creek Region Conservation Authority. Gravel operations in progress in background. Photo courtesy of Consolidated Sand and Gravel Company.

The swimming pool at St. Mary's, Ontario, has been developed on the site of a former quarry. Photo by M.A. Vos.

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